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Dr. Middleton PHYS 132 HW
3-6-17

Ch. 31
CQ: 6
P: 10, 16, 42

Problems

31. P.10

100 W
120V
7.0×10^{-2} m long
Tungsten filament
$9.0\times10^{-7}\ \Omega$m resistivity
Diameter of wire?

$P = \frac{\Delta V^2}{R}$ $\quad \Delta V = 120V$ $\quad P = 100W$

$R = \frac{\Delta V^2}{P}$

$R = \frac{(120V)^2}{100W}$

$R = 144\ \Omega$

$\rho = 9.0\times10^{-7}\ \Omega$m
$l = 7.0\times10^{-2}$ m
$R = 144\ \Omega$

$R = \frac{\rho L}{A}$

$A = \frac{\rho L}{R}$: $A = \pi r^2$

$\pi r^2 = \frac{\rho L}{R}$

$r = \sqrt{\frac{\rho L}{\pi R}}$: $D = 2r$

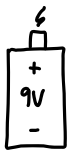
$D = 2\sqrt{\frac{\rho L}{\pi R}}$

$D = 2\sqrt{\frac{9.0\times10^{-7}\ \Omega m\,(7.0\times10^{-2}\ m)}{\pi(144\ \Omega)}}$

$D = 2.36\times10^{-5}$ m

$D = 2.36\times10^{-5}$ m

31. P.16



$\Delta V = 8.5V$, $R = 20\ \Omega$

$P_{Bat} = I\mathcal{E}$ $\quad I = \frac{\Delta V}{R}$

$\Delta V = 8.6V$

$R = 20\ \Omega$

$I = 0.425A$

$r = 1.18\ \Omega$

$\Delta V_{Bat} = \mathcal{E} - Ir$

$r = \frac{\Delta V - \mathcal{E}}{I}$

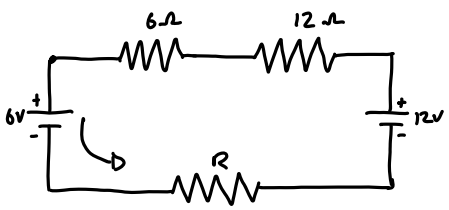
$\mathcal{E} = 9.0V$

$\Delta V = 8.5V$

$r = 1.18\ \Omega$

$I = 0.425A$

31. P.42



$P_r = 0.375W$

$-I(6\Omega) - I(12\Omega) + 12V - I(R) - 6V = 0$

$-I(18\Omega) - I(R) + 6V = 0$

$-I(18\Omega + R) = -6V$

$18\Omega + R = \frac{6V}{I}$

$I = 0.25A$

$R = 6V/I - 18\Omega$

$R = 6\Omega$

$P_R = I\Delta V_R$: $I = \frac{\Delta V}{R}$ $\quad \Delta V = IR$

$I = 0.25A$ $\quad \Delta V = 1.5V$

$P_R = 0.25A(1.5V)$

$P_r = 0.375W$

$R = 6\Omega$

$\frac{1}{4}\left(\frac{3}{2}\right) = \frac{3}{8}$

Conceptual

$I = \frac{\Delta V}{R}$

31. C. 6

$P = I\Delta V$

I: $I_C > I_a = I_d > I_B$

ΔV: $I_C = I_d > I_A > I_B$

$P_C > P_D > P_A > P_B$
$P_C = 8W$ $\quad P_A = 1W$
$P_D = 2W$ $\quad P_B = \frac{1}{8}W$